Con.6151-11. MP-5809

(REVISED COURSE)

(3 Hours) [Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory**.
(2) Attempt any **Four** questions out of remaining **six** questions.
(3) Assume **suitable** data.
(4) Assumption should be **clearly** stated.

1. (a) What is the CT number of cartilage whose attenuation coefficient is 0.28 cm^{-1} **5**
and attenuation coefficient of water is 0.195 ? (Magnification constant is 500).

(b) A hydrogen proton is placed in magnetic field of 2.5 Tesla. Calculate the amount   **5**
of photon energy required to switch from spin-up state to spin-down state.
(Plank's constant = 6.6×10^{-34} J. sec., Gyromagnetic ratio = 26.8×10^7 Hz/T).

(c) Explain the construction and working of Xenon-gas detector with the help of   **10**
diagram.

2. (a) Explain slice selection, frequency and phase encoding in MRI with the help   **15**
of diagrams.

(b) Compare permanent and superconducting magnets.   **5**

3. (a) Explain Radon Transform and its significance in CT imaging.   **10**

(b) Find the projections of the image given below and reconstruct the image using   **10**
iterative ray by ray construction technique.

2	3
4	7

4. (a) Explain the technology used in spiral CT machine. Define Pitch.   **10**

(b) Compare EMI scanner with 3rd generation CT scanner with the help of diagrams.   **10**

5. (a) List the various suppression and localization techniques in Magnetic Resonance   **10**
Spectroscopy (MRS). Explain any one single voxel spectroscopy in detail.

(b) Explain the metabolites of MRS spectrum. Explain any one water suppression   **10**
technique in detail.

6. (a) Explain T_1, and T_2 relaxation times and their importance in MRI imaging.   **10**

(b) What are the biological effects of CT ?   **5**

(c) Hydrogen atom (H') is placed in magnetic field strength of 3 Tesla. Calculate   **5**
the larmor frequency. (Gyromagnetic ratio of H' = 26.8×10^7 Hz/T, Planks constant
= 6.6×10^{-34} J /sec, Nuclear spin I = ½)

7. Write short notes on (any **three**)   **20**
(a) Electrical Impedance Tomography
(b) PET-CT hybrid imaging
(c) Filtered Backprojection reconstruction technique
(d) Artifacts in CT-imaging.